

## The medical benefits of Mushrooms in Public Health

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### Abstract

Mushrooms are fungi, particularly the order of Basidiomycetes or Ascomycetes, fleshy-fungi with a small umbrella like structure. The use of mushroom takes a different approach among other fungi not all mushrooms are edible. There are more than 70,000 fungi species discovered in the world, only few edible mushrooms from the forest in West African countries in particular Nigeria are consumed as food. Agaricales are edible while Amanita species are non-edible mushrooms. Mushrooms are unique because both edible and non-edible have medicinal values. This review unveils medicinal benefits of mushrooms in public health through the analysis of the historical perspective of the organisms, methods of cultivation, methods of extraction, and various medical implications such as it is used in the treatment of cancer. The therapeutic effect of mushrooms consumption in diet cannot be overemphasized in the public health, because compounds extracted from mushrooms such as *Agaricus blazei* is capable of healing cancer, arteriosclerosis, hyperlipidemia, chronic hepatitis and diabetes. In general, chronic catarrh, breast and hinges illness can be taken care of with the aids of medicinal mushroom. Others illnesses that consumption of mushrooms can heal include jaundice, dropsy, intestinal worms, tuberculosis, rheumatism and gout.

### Introduction

A mushroom or toadstool is the fleshy, spore -bearing fruiting body of a fungus, typically produced above ground, on soil, or on its food source. Mushrooms are fleshy-fungi with a small umbrella like structure. The part include cap like structure known as pileus (Plural: Pili) which is attached with a thread like structure known as mycelium (plural: mycelia). Mushroom derives nutrients from the soil with the aid of mycelia (Deacon, 2006). However, there is no need of sunlight for their growth. Basically, mushroom grows on animal wastes, dead decay plants like wood, rice straw, plantain leaves and orange leaves and humus (Okigbo and Nwatu, 2015; Webster and Weber, 2007).

Mushroom grows on moist soils which are so rich in organic matter (Teferi et al., 2013). The use of mushroom takes a different approach among other fungi because not all mushroom are edible. Mushrooms are fungi, particularly the order of Basidiomycetes or Ascomycetes are fleshy-fungi with a small umbrella like structure. Despite the fact that there are more than 70,000 fungi species discovered in the world, yet only 31 general of 2000 species are edible mushrooms while about 10% of some 30 species are poisonous mushrooms (Zeid et al., 2011). Obviously the study of mushrooms based on how people of a particular location and culture make use of it reveals the description, biology,

cultivation, nutritional values, medicinal properties, storage and benefits of consumption of mushrooms to human beings (Okigbo and Nwatu, 2015; Deacon, 2006). Nevertheless, edible mushrooms from the forest in West African countries, Nigeria in particular, are consumed as food. Some of these species belong to order agaricales and amanita. Agaricales are edible mushroom while amanita species are non-edible mushroom (Okigbo and Nwa, 2012; Idio and Obinaju, 2013).

Mushrooms are unique because both edible and non-edible ones have medical benefits. This review unveiled benefits of mushrooms in public health through the analysis of the historical perspectives of the organisms, methods of cultivation, methods of extraction, and various medical implications such as it is used in the treatment of cancer.

### Significant of Mushroom in Public Health

The role mushroom play in medicine cannot be overemphasized in public health as many countries such as China, Nigeria and others sees it beyond the level of single cell protein but a vital product of great medical benefits. The following are significant health benefit of mushroom:

- i. Organoleptic Function: *Lentinus edodes* (Shiitake mushroom) are used for the purpose of organoleptic function. So, regular consumption of whole medicinal, edible mushrooms could introduce a functional or medicinal contribution within the individual's diet. The extent of the health beneficial effect will be dependent on the level and regularity of consumption and the relevance of whole fresh medicinal mushrooms. Therefore, when mushroom is used as therapeutic agents, the mushroom can be consumed as powdered concentrates or extracts in hot water, and the extract concentrated and used as a drink or freeze-dried or spray-dried to form granular powders which allow easier handling, transportation and consumption (Mizuno et al., 1995). As such, these liquid concentrates or dried, powdered mushrooms contained in capsules can be considered as dietary supplements or mushroom nutraceuticals with potential health benefits (Chang and Buswell, 1996). Mushroom nutraceuticals are usually crude mixtures and should not be confused with pharmaceuticals which are almost invariably a defined chemical preparation, the specifications for which are listed in pharmacopoeia. Regular intake of these concentrates is believed to enhance the immune responses of the human body, thereby increasing resistance to disease and in some cases causing regression of the disease state (Jong et al. 1991).
- ii. Disease Resistance: Mushroom are taken as supplements in traditional medicine of Chinese as well as used alongside with various

combinations especially with other herbal products to treat many medical conditions. This is also the same in Japan because a limited number of highly purified polysaccharide compounds derived from certain medicinal mushrooms are now being used by Japanese as immune system modulation just as it was being used in Chinese holistic medicine. So, compounds derived from certain medicinal mushrooms are used extensively in the Orient to increase disease resistance to normalise body functions. Such extracts are used to treat deficient principles; they are very important to life for energy through production of blood or other body fluid and help proper function of some organs such as the kidney (Alinia-Ahandani et al., 2018).

iii. Treatment of Cancer: One of the most noticeable features of extracts derived from many medicinal mushrooms is their ability to function as immune modulators. Physiologically, host defense mechanisms are improved by the intake of these mushroom compounds which restore homeostasis and enhance resistance to disease. A central premise in Oriental medicine is to regulate homeostasis of the whole body and to return the diseased individual to the normal state. It is interesting to note that several of the medicinal mushrooms and their concentrates are becoming particularly popular in the US – the movement began with a drive towards “healthy food” in the 60s-70s; now it is towards “healthy medicine”. People are interested in the medicinal mushrooms because they appear to have been used with considerable effect for hundreds of years in the Orient while many modern widely used pharmaceuticals while offering undoubted health benefits can also in some cases have serious side-effects. (Cassileth, 2000; Curt, 1998). Meanwhile, immune-stimulating agents would possibly be useful adjuncts to conventional treatments of cancer if they do not interfere with the ability of the conventional treatment to kill tumour cells. These approaches, like chemo- and radiotherapy, are designed to cause the destruction of tumour cells but to be much more tumour-specific than present treatments and, consequently, less harmful to normal cells. Obviously, this reveals a slogan used for the purpose of optimal health and the tenet of Hippocrates c 400 B.C. that “Let food be your medicine and medicine be your food” which went viral among many people for over the last 2-3 decades scientific as medical studies have been carried out in Japan, China, Korea and more recently US which have increasingly demonstrated the potent and unique health enhancing properties of compounds extracted from a range of medicinal mushrooms.

iv. Mushrooms are used as therapeutic foods: They prevent diseases such as hypertension, hypercholesterolemia, atherosclerosis and cancer mainly due to their chemical composition (Daba et al., 2008). Mushrooms are the fruiting bodies of certain types of fungi play key roles in forest ecosystems that they have unique abilities to break down wood, leaves, and other organic matter and recycle nutrients back into the system. Pleurotus species are popular and widely cultivated throughout the world mostly in Asia and Europe owing to their simple and low cost production technology and higher biological efficiency (Fekadu, 2000) describes that, the higher contents of mushrooms is water (90%), protein (2-40%), fat (2-8%), carbohydrates (1-55%), fiber (3-32%), and ash (Florezak et al. 2004 Wannet et al., 2000, Singh and Singh, 2002).

v. Mushrooms prevent hypercholesterolemia and cardiovascular diseases: Mushroom also have high fiber content, proteins, microelements, and lower caloric content are almost ideal for a nutrition program aimed to prevent hypercholesterolemia and cardiovascular diseases. Therefore, it aids lowering of lipoprotein cholesterol and cholesterol in the blood. Thus mushrooms serve as antioxidant and help in the regulation of blood lipid levels thereby aids in the regulation of blood glucose levels (Selima et al., 2012).

vi. Medicinal Food: Mushrooms are medicinal foods that are rich in nutrition that recognized by medical profession throughout the world. So in public health, mushrooms have eight important amino acids, polyunsaturated fatty acids and small amounts of saturated fatty acids and have higher nutritional values than fish or beef (Fekadu, 2000).

#### Application of Mushroom in Medicine

Mushrooms are so useful nowadays especially in medicine (Girma et al., 2018), for treatment of hypertension, diabetes, hypercholesterolemia and cancer. This is possible as a result of chitin and beta glucans which are dietary fiber capable of serving as antitumor, antiviral, and antithrombotic and immunomodulating agent properties and some mushrooms may have potential to lower elevated blood sugar levels (Jose et al., 2002). According to the report of Sasidharan et al. (2010), Pleurotus species have high medicinal value (Alinia-Ahandani et al., 2018).

#### Mushrooms as Antitumor Agent

Some mushrooms such as *Lentinus* (*Lentinula*) *edodes*, *Schizophyllum* commune, *Grifola frondosa*, and *Sclerotinia sclerotiorum*, particularly their respective  $\beta$ -glucans, lentinan, schizophyllan (also called SPG, sonifilan, or sizofiran), grifolan, and SSG are known for antitumoral activity. Most of the  $\beta$ -(1-6)- branched  $\beta$ -(1-3)-linked glucans, are able to act as antitumor activity (Manjunathan and Kaviyaran, 2010). Ethyl acetate, methanol and aqueous extract of *Pleurotus rimosus* can inhibit the Dalton's Lymphoma Ascites (DLA) cell line induced solid tumor and EAC cell line induced ascites tumor in mice but the antitumor effect is high in ethyl acetate extract than the other extracts. Antitumor activity of is again used by According to Joseph et al. (2009), methanol extracts of *G. lucidum* gave significant antitumor properties by inhibiting the tumor development in EAC cell line induced solid tumor model in mice. Polysaccharides extracted from mycelium and fruiting bodies of *L. tuberregium* effectively inhibited solid tumour proliferation in mice (Halliwell, 2003).

#### Anti-inflammatory Agent

Extracted ethanol from cultured mycelium of *M. esculenta* is well known for its anti-inflammatory activity and is important but based on dose to inhibit both acute and chronic inflammation in mice model that is comparable to the standard of Diclofenac. The acute and chronic anti-inflammatory activities of ethyl acetate and methanolic extracts from *G. lucidum* are expressed through carrageen an induced acute and formalin induced chronic inflammatory models in mice (Joseph et al., 2009; Halliwell, 2003).

#### Mushrooms as Antioxidant

Oxidation is essential in many living organisms for the production of energy to fuel biological processes (Girma and Tasisa, 2018; Halliwell, 2003). However, uncontrolled production of oxygen-derived free radicals results in the onset of many diseases, such as cancer, rheumatoid arthritis and atherosclerosis, as well as in degenerative processes associated with aging (Lakshmi et al., 2003). Ethyl acetate, methanol and aqueous extract of *G. lucidum* are high inhibitor of  $O_2\bullet$  and  $\bullet OH$  radicals, but aqueous extract cannot inhibit ferrous ion induced lipid peroxidation whereas ethanol extracts of the mycelium of *G. lucidum* as high antiperoxidative activity (Joseph et al. 2009; Lakshmi et al., 2003).

### **Conclusion**

The therapeutic effect of mushroom cannot be overemphasized in the public health because compounds extracted from mushrooms such as *Agaricus blazei* which is capable of healing cancer, arteriosclerosis, hyperlipidemia, chronic hepatitis and even diabetes. Thus, apart from consumption of mushroom as food; it also play major role in medicine such as anti-inflammatory, antitumor, anti-hypertension, anti-hypercholesterolemia and antioxidant. Also, chronic catarrh, breast and hinges illness, jaundice, dropsy, intestinal worms, tuberculosis, rheumatism and gout can be cured by medicinal mushroom.